The risk ranking of drinkable water sources of sarkhun plain aquifer villages (case study: Sarkhun village- Ghal'e Ghazi district of Bandar abbas)

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Abstract

Water is one of the most principal needs of human beings. Water is life basis and the reason of forming most places in the ground level. The shortage of healthy drinkable water in the third world countries such as our country is discussed as one of principal problems. The lack of control in quality and harvesting rate and unstrained consuming can increase these problems and earn serious threats. Hence it is necessary to consider different management aspects with principal policies. One of the newest functions in this area is risk management which World Health Organization also emphasizes on it (Swedish, 2009). This research with the recognition and risk ranking which drinkable water sources in the aquifer rural centers is threatened making priority and the ranking of these centers on the basis of the present risk rate in the drinkable water sources. The research method in this descriptive- analytic research used the random method and the preparation of questionnaire from two landscapes of rural managers and responsible officials. Statistics society of Sarkhun aquifer and the rural managers of Sarkhun village and 20 persons of officials were selected as statistics sampling. At last these villages by the using of AHP model (hierarchal analysis) and TOPSIS ranking is divided in five levels such as: the villages with very high risk, villages with high risk, villages with average risk, villages with low risk and the villages with very low risk.

Key words: Water source, Risk management, rural areas, Sarkhun village

1. Introduction

The most important renewable source of human life on Earth depends on its existence, surface and underground water resources. There is a basic requirement for the development of the water resources in the social, economic and culture is stable. Limits the increased use of renewable water resources and increasing population has caused underground water resources are in critical condition. Natural cycle of life in the two major problems faced by human entry. First impression of excessive groundwater withdrawal and the latter become part of the waste water, drainage and waste that endangers the health of the consumer. Based on international criteria of a severe water crisis faced. Limited resource that would be available if water quality has to be so used. Sign up today with widespread industrial and agricultural use of fertilizers is the main source of human life in jeopardy.(TANWIR et al. 2007, 8)

On the other hand, a third of people in developing countries are deprived of clean drinking water to Africa is the most vulnerable people, only 17 percent have access to safe drinking water. (KLM, MOGANEDI et al 2007,8). In our country, Iran is dominated by the dry climate of large areas of land and water resources are increasingly limited supply, efficient use of available water resources are becoming the necessary and inevitable. (Hasan Oghli and others, 2005). World Bank report on the country, the lower the per capita water supply, loss of water quality, inefficient use efficiency monitor for use in industrial and agricultural sectors, land salinity, poor state of maintenance and repair of vessels, restrictions on compensation costs and a lack of coordination between agencies relevant to the challenges facing the country mentioned water (WORLD BANK 2004).Therefore, the existing problems of rural water supply and clean water is important. Providing clean water and sanitation as a result of government requirements that need to be managed and Storage tanks and control of drinking water quality in rural areas is to ensure that consumers are not exposed to pathogens (sadeghi et al 2003,2004).

The most general definition of risk is also clear that the two aspects of loss and uncertainty are discussed. But the third of its choice, which is often cited as an implicit choice of how to pay attention to it. The three main pillars of the condition and the risk are the basis for a deeper investigation. Risk management is the process of measuring, or assessing risk and then plan strategies to manage risk. Overall strategies used include transferring the risk to another, avoiding the risk, reducing the negative effects of risk, and accepting some or all of the consequences of a particular risk (DORFMAN, 1997).

Good risk management is a process by which to classify the risks injury most likely at highest risk with less risk and lower injury are discussed below.

In practice, this process may be very difficult and often balancing They're much easier to draw up possible risks and losses that are low risk and low risk to high losses in their lending It may not be properly addressed (Babai, Minister Zanjani, 1385, 5). Also, search for and locate risks before they become a problem in one of the most important steps in this approach.

According to what was said, the main goal of the present study was to investigate the network and storage Distribution of drinking water and to identify and classify the risks that these resources Maintenance and supply of drinking water is threatened, and finally prioritized based on the risk level is classified rural centers. This part of the study area villages GHALE GHAZY squadron of Bandar Abbas Township in Hormozgan province.

2. Data and Material

City of Bandar Abbas, with an area of about 27,316 square kilometers, which is located north of the Strait of Hormuz in the north to the Haji Abad, from the East and from the West to the Mesopotamian city Minab and pulp and location to the city from the south to the Persian Gulf and the Qeshm city is limited. Political divisions of the last 82 years, according to the city of Bandar Abbas has 4 sections named Finn, center, and Justice Department castle bed (4 sections) and has 10 municipalities and its capital Bandar Abbas. GHALE GHAZY squadron of Bandar Abbas on the part of two district judges is divided into SARKHON and GHALE GHAZY. According to the last Population and Housing Census Sarkhoun rural population in 1385 to 4875 people. Water from five wells in the villages, and partly by the Bandar Abbas refinery is funded rural water and sewage companies

Water transfer system	Provide water source	Exploitation year	Covering situation	Tank type	Tank volume (m3)	Distribution network (km)	Pipe calibrate	Pipe type	Joint number	Village name	number
pomp	well	1365	Under covering	concrete	500	62		Polyetylen	1450	SARKHON	1
pomp	well	1383	Under covering	concrete	200	0/5	90	Polyetylen	45	GHADEHAR	2
pomp	well	1384	Under covering	concrete	200	0/5	90	Polyetylen	40	KAHORY	3
pomp	well	1384	Under covering	concrete	200	0/8	90	Polyetylen	80	FATHO JALIL	4
pomp	filtration	1370	Under covering	concrete		1	90	Polyetylen	60	NANG	5
pomp	filtration	1370	Under covering	concrete		0/8	90	Polyetylen	80	BAGHO	6
pomp	well	1365	Under covering	concrete		75	90	Polyetylen	1200	GHALE GHAZ	7
pomp	well	1365	Under coverin	concrete		70	90	Polyetylen	800	TAKHT	8

Table 2) village under covering village water and Sewage Company

3. Research Methodology

Research methods in the study of descriptive - analytic measurement are a way. The statistical population of the aquifer, and the sample was selected rural manager villages and authorities. Information through library studies, direct observations and questionnaires completed by 7 rural manager and 20 persons of official's water and sewage companies were collected. Rural villager group selected for the reason that in the new order village management in the country rural manager as nature village management recognized and partnership in to give, presentation and keeping healthy water is a part of duty of rural manager. In preparing the questionnaire, the relevant theoretical study, the risk of drinking water risks 7 groups (management), related to human factors natural factors, where switching the source and sink, source and reservoir characteristics and risks related to the quality Physical and chemical quality of water and water-related risks, risks were classified bacteriological water. Planning questions in form specter LIQRET that sum of distinction, to show situation risk the group in the any village, weight of any group that as risk original index to take in to the water source take in AHP model and with use Expend choice software. Then according to the weight and the risk status of the rural resource centers with TOPSIS model rural centers were ranked and graded.

Indicators	Types of risks
Managers and senior officials, malaise and indifference in matters concerning water resources and risks that threatens it.	Risks due to human factors (managerial) (A)
Lack of adequate funding for the construction or improvement of water resources and the maintenance of	
No maps where water sources, reservoirs, transmission lines and distribution networks is clear (especially when hazards)	
The care and protection of water resources in the village like no Guardian	
Participation of local leaders (councilors and rural manager) in the management of water resources	
Lack of local engineers and experts in the selection and management of water resources	
People not involved in the operation and maintenance	
Proper use of water resources and not waste it	
Water pressure is not uniform in all regions used	
Interruption or shortage of water in the hours or days of the year	
Risks and hazards associated with their destructive and aggressive	
Lack of exploitable water resources around the village	Risks arising from natural factors (B)
There is good water, but villages downstream	
Resources away from rural high-distance path that leads to the village's water and possible problems arising from the	
Incline Village and the possibility of large water distribution network problem because	
Cold and possible frostbite at the source, reservoir and pipeline network	
Evaporation and water loss in reserves or resources	
Drought or declining groundwater levels	
Distance waste collection	Risks relating to the location
Distance from the cemetery	

Distance from factories and industrial units	of water sources implantation (C)
Away from livestock	
Distance from wells, sewage networks and	
Being exposed to floods	
Being exposed sliding	
Source and sink located along heavily traveled routes (my own, my car and commute routes humans is high)	
Source and sink into the ground and allow agricultural fertilizers and pesticides used in agriculture to	
Possibility of contaminants entering the water to wash vehicles	
Lack of water distribution network	
Unprotected source and sink	Risks relating to the physical characteristics (D)
A tank seams and gaps	
Allow different types of dry waste tank	
Reservoir quality and water lines (the pipes)	
Lack of strength, not a strong shield tank and its	
Lack of resources or lack of privacy, tanks and pipelines	
Non-compliance and violation of privacy (Privacy mode, that is)	
Poor water quality in terms of odor (smelly water(	Risks related to the physical quality of water (E)
Poor water quality in terms of color	
Poor water quality in terms of taste	
Turbid water (especially when it rains(	
Continuous quality monitoring of water quality authorities	
Non-toxic inorganic chemical quality of water (mg) of substances such as mercury, lead, asbestos, water	Risks related to chemical quality of water (F)
Quality of water in terms of toxic organic chemicals (micrograms per liter) of substances such as benzene and poly Klrv, Atrazine	
Non-chemical water quality in terms of non-toxic materials (mg) of materials such as aluminum, copper, nitrates according No(2)	
The lack of clean water and non-coli form	Risks related to bacteriological characteristics of water (G)
There are more than 3 coli forms in water and untreated	
There are more than 10 coli forms in water pipes, such as wells, springs and subterranean	

Table 1: Classification of Risk

4. Results and Analysis

The procedure is as follows:

1- The Decision Matrix: This matrix C_j → j= 1,2,…,n represents the index A_i → i= 1,2,…,m represent the options before making decisions, and x_{ij} → i= 1,2,…,m, j= 1,2,…,n is the value of the options as the following matrix:

$$A_{ij} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ . & & & . \\ . & & & . \\ . & & & . \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}$$

2- Matrix of Decision no Scale: Scale modeling technique based on the decision matrix norm squared sum of each component can be divided into two components corresponding column. This is the mathematical form of the following equation:

$$nij = \frac{X_{ij}}{\sqrt{\sum_{k=1}^{m} X_{ij}^2}} \qquad (1)$$

3- Weighting the index: This model is based on Analytical Hierarchy Process (AHP) and the software will do Expert choice. The inconsistency rate is 0.03, which falls within the range of acceptable inconsistency.

	A	B	C	D	E	F	G	weight
A	1	4	3	3	½	3	½	0/2
B	¼	1	½	1	¼	½	1	0/075
C	1/3	3	1	2	1/3	1/5	1/3	0/099
D	1/3	1	½	1	1/3	1/3	1/6	0/046
E	2	4	3	3	1	1/5	1/3	0/149
F	1/3	2	5	3	5	1	1	0/217
G	2	1	3	6	3	1	1	0/224

Table 3. couple comparison matrix

4- The weight matrix of indicators: As can be seen in Table 3, entries on the main diagonal of the matrix represent the weights and put the rest of the entries are zero.

0/2	.	.	.	.	.	.
.	0/075	.	.	.	.	.
.	.	0/099	.	.	.	.
.	.	.	0/046	.	.	.
.	.	.	.	0/149	.	.
.	.	.	.	.	0/217	.
.	.	.	.	.	.	0/224

Table 4. Index weight matrix

5-The Matrix weighted no Scale: no Scale of decision matrix multiplication in a matrix of weights, a weight matrix is no scale is achieved.

6-Find the positive and negative ideal solutions for each of the indicators

A-= {v-1 , v-2 ,…, vn-} A* = {v1* , v2* ,…, v*n}

	A+	B+	C+	D+	E+	F+	G+

R+	0/0274177	0/0097477	0/0137099	0/0069651	0/0212184	0/0331362	0/0321301
	A-	B-	C-	D-	E-	F-	G-
R-	0/0231373	0/0085541	0/0104966	0/0047982	0/0158098	0/0220908	0/0225474

Table 5. Negative and positive aim answer

7- by determining the relative distance between the positive and negative of each option according to the following relationship:

$$S_i^* = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^*)^2} \quad S_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij} - v_j^-)^2} \quad C_i^* = \frac{S_i^-}{S_i^- + S_i^*}$$

8- Rating based on the amount of Ci *. These rates fluctuate between $0 \leq Ci^* \leq 1$. In this regard, Ci * = 1 represents the highest level and also represents Ci * = 0 is the lowest rank. Table 6 positive spacing, negative spacing relative to each option and finally shows the ranking.

grade	S*	S-	S+	village
7	0/93632	0/000233	0/000015	SARKHON
2	0/159879	0/000034	0/0001776	GHADEHAR
4	0/031035	0/000009	0/0002676	KAHORY
8	0/975364	0/000239	0/000006	FATH O
6	0/926693	0/000214	0/0000169	NANG
1	0/159674	0/000033	0/0001755	BAGHO
3	0/189825	0/00004	0/0001688	GHALE
5	0/671953	0/0001	0/0000487	TAKHT

Table 6. Relative, negative, positive space and village center grade

Finally, the study centers on the risk of drinking water reservoirs and distribution network divided into five levels:

Level 1: high-risk rural
Level 2: a high-risk rural centers
Level 3: Intermediate-risk rural centers
Level 4: low-risk rural centers
Level 5: rural centers with minimal risk

Level Five	Rank	Level Four	Rank	Level three	Rank	Level two	Rank	Level A	Rank
SARKHON	7	TAKHT	5	CHAH HASSAN KAH	4	GHALEEGHAZI	3	BAGHOO	1

				OORI					
FATHOLJALIL	8	NANG	6	-	-	-	-	GHADEHAR	2

Table 7. Classification of rural drinking water supply and storage risks

5. Conclusions

Water main importance is also increasing the population of researchers and planners have focused on providing safe drinking water. Ideal (Topsis) much positive and negative weights obtained by multiplying each of the villages was based on a priority ranking was obtained. According to the result Jalil has conquered village in rural BAGHU highest risk is minimal. The rural sites were ranked according to five levels: a) rural areas with very high risk, b) high-risk rural centers, c) moderate-risk rural centers, d) low-risk rural centers, e) Centers Rural low-risk groups. That, in a rural area BAGHU, GHadehar high-risk, high-risk castle in the village, the village well, good mesquite third-risk, medium-risk, low-Tang bed at four villages in the five villages Jalil conquered dark gray and very low risk level is classified. Health, water resources, with emphasis on risk management approach under the water and wastewater professionals in rural and village participation is recommended.

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